**DOCUMENT RESUME**

**ED 184 675** **PS 011 300**

| | |
|---|---|
| AUTHOR | Mayesky, Mary E. |
| TITLE | Differences in Academic Growth as Measured in an Extended Day Program in a Public Elementary School. |
| PUB DATE | Feb 80 |
| NOTE | 27p.: Paper presented at the Annual Conference of the American Association of School Administrators (Anaheim, CA, February 18, 1980) |
| EDRS PRICE | MF01/PC02 Plus Postage. |
| DESCRIPTORS | *Academic Achievement: *After School Programs; *Enrichment Activities: *Extended School Day; Mathematics: Primary Education: *Program Effectiveness: Reading: *Remedial Instruction |
| IDENTIFIERS | *Phillips Extended Day Magnet Program |

ABSTRACT

Math and reading achievement scores were compared for extended day (ED) and non-extended day (NED) children in grades 1-3 of the Phillips Extended Day Magnet Program. In the before school (7:00-8:15 a.m.) and after school (2:45-6:00 p.m.) hours, ED children participated in an enrichment and remediation program in the core areas of math/science, art, music, physical education, individual tutoring, homework completion, and learning center/library and in special activities such as languages, weaving, drama, dance, karate, and wrestling. During school hours, the ED children attended the regular academic program at Phillips with NED children. There were no socioeconomic, social, or racial differences between ED and NED children. Achievement test data were collected for the first two years of the program for ED and NED children in two groups: Group 1 children were in first grade during 1977-78 and second grade in 1978-79 and Group 2 children were in second grade during 1977-78 and third grade in 1978-79. Results showed that in math, both Group 1 and Group 2 ED children significantly outscored NED children over the two program years. In reading, ED children had significantly higher reading scores than NED children only in Group 1. Due to the absence of controls, it could not be conclusively stated that the Extended Day Program alone accounted for these differences. However, it was concluded that some variable or combination of variables in the extended day environment made a positive contribution toward the children's academic growth. (JMB)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED184675

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

# DIFFERENCES IN ACADEMIC GROWTH AS MEASURED IN AN EXTENDED DAY PROGRAM IN A PUBLIC ELEMENTARY SCHOOL

By

Mary E. Mayesky, Ph.D.
Department of Education
Duke University

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

M. E. Mayesky

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

September, 1979

PS011300

CONTENTS

I. Introduction

II. Description of Program

III. Purpose of Study

IV. Methodology
- A. Description of sample
- B. Data Collection
- C. Data Analysis
  1. Descriptive Data Analysis
  2. Analysis of Variance

V. Results
- A. Descriptive Data
- B. Analysis of Variance

VI. Summary and Conclusions

VII. Educational Implications of Program

VIII. Appendix A
Description of Reading (PRI) and Math (DMI) State Tests

## I. Introduction

With the rising numbers of working and/or single parents in the United States, a growing trend in many public school systems across the U.S. has been the addition of an "Extended Day" program in elementary schools. In essence, such programs are designed to provide before and after school care for children in grades K-5 of working parents. The forms of these programs span a spectrum including simple custodial/physical education-type programs to more formally designed academically-based curricula. Despite this growing trend of public school involvement in child care, virtually no attempts have been made to study the possible educational benefits of this extended time spent in school. A review of the literature confirms this paucity of attempts to research these after school programs and their academic effects.

## II. Description of Program

The Phillips Extended Day Program was initiated in September, 1977 to serve K-5th grade children of single and/or working parents from 7:00 a.m. to 6:00 p.m. daily. In the before (7:00 a.m. - 8:15 a.m.) and after (2:45 - 6:00 p.m.) school hours children participated in an enrichment and remediation program in the core areas of math/science, art, music, physical education, individual tutoring, homework completion, and learning center/library.

In addition to these set program components, children participated one or two days per week by self-choice in a variety of special activities, some of which included languages, weaving, drama, dance, karate, wrestling, etc.[1]

## III. Purpose of Study

As the Phillips Extended Day Program was designed to correlate and expand on the academic curriculum, the purpose of this exploratory descriptive study was to determine if there was any difference between the academic achievement (math/reading) of children in the Extended Day Program and those not.

As action research, the following study lacks the controls of pure experimental research as well as the external validity. However, as the researcher was designer/principal of Phillips and a parent of a daughter in the program, this initial research represents a personal and professional attempt to /begin filling the void of objective data on after school programs of this type.

The following reports the results of the statistical analysis of objective test results of Extend d Day (ED) and non-Extended Day (NED) children in grades 1-3 two program years (1977/8 and 1978/9) in the Phillips Extended Day Magnet Program.

This report is organized into the following sections:

I. Methodology
   - Description of Sample
   - Data Collection
   - Data Analysis

II. Results
   - Descriptive Data
   - Analysis of Variance

III. Summary and Conclusions

IV. Educational Implications of Program

## IV. Methodology

### Description of Sample

Children in grades K-5 participated in the Extended Day Program. These same ED children attended the regular academic program at Phillips with those children not enrolled (NED) in the program. There were no socioeconomic,

social, or racial differences between children in the Extended Day Program and those not.

Since Phillips was designed as a magnet school, enrollment was open to all interested parents by application. Consequently, children from a wide spectrum of socioeconomic, racial, and ethnic groups were enrolled at Phillips. In 1977/8 there were 108 ED children and 68 NED children. In 1978/9 115 were enrolled in ED and 65 did not participate.

Participation in the ED was a direct choice of the parents desiring the child care service. Although it may be argued that a more interested parent would enroll a child, and thus influence a child's learning, the spreading mean difference reported in Section V. - Results between ED and NED children over the two-year period may cast some doubt on this possible differentiating factor. Finally, while the numbers in both groups are small, the mean differences are consistent over two years and measured significant at the .05 and .01 levels in the analysis of variance, described in Section V. - Results.

Data Collection

As North Carolina state tests in reading and math are administered to children in grades 1, 2, 3, 6 and 9 yearly, it was possible to study the academic growth of children in grades 1, 2, and 3 over a two-year period. Thus, objective data in reading and math was available for comparison of two groups: Group 1 - 1977/8 First Grade - 1978/9 Second Grade; and Group 2 - 1977/8 Second Grade - 1978/9 Third Grade. Scores were analyzed only for children who participated both complete program years. Mid-year transfers and grade retentions were not included in the analysis.

For a specific description of the reading and math state tests, see Appendix A. The Prescriptive Reading Inventory (PRI) and the Diagnostic Mathematics Inventory (DMI) were the two objective tests used to measure reading and math achievement.

Data Analysis

Descriptive Data Analysis

In the initial analysis, state test data in reading and math were analyzed for ED, NED, and total group using simple mean and mean increase scores. Analysis by year as well as a comparison of scores over the two program years 1977/8 and 1978/9 are reported in Table I. In analysis of individual and comparison of years scores, simple mean scores on the reading and math tests were computed for ED and NED children as well as for the total group in the categories of national percentile, scale, and stanine scores.

Stanine Scores -

Stanine scores were used in that they represented units on an equal interval scale. Since there is an equal degree of difference between any two successive stanines, ED and NED stanine scores were readily comparable.

The stanine's limited range of values was an advantage in that it reduced the possibility of magnifying small differences between scores of ED and NED children and thus, conceals some measurement error. The units of measurement, on the other hand, are too insensitive to detect small gains.

National Percentile Scores -

It is noted, however, that stanines are less precise than percentile ranks. Thus, the mean scores on percentile rank were used to compare a pupil's relative standing in reading and math. National Percentiles also allowed for the comparison of ED and NED students' relative positiions at different times in reading and math, as the norm group of each of the year's tests consisted of tne same students.

Scale Scores -

Whereas percentile ranks do not represent equal-interval scales and are limited for purposes of statistical treatment, the scale scores for the CAT are produced from a single equal-interval scale of scores across all grades for use with all levels and forms of the test.

The scale scores are expressed in 3-digit numerals, ranging from approximately 100 through 950. These scale scores were particularly useful for measuring growth of ED and NED students over the two-year period. Because they are scaled by a procedure intended to produce equal-interval scores, the differences between all pairs of consecutive scores can be assumed to reflect equal amounts of academic growth.

Since these scores have the same meaning regardless of grade levels being tested, it was possible to make direct comparisons of the rate of growth for ED and NED students across grade levels.

The scale scores for the PRI and DMI are estimated scores that were derived by CTB/McGraw-Hill by correlating objective scores on the criterion-referenced tests with the California Achievement Test scores (norm-referenced) at the first and second grade.

Table I presents mean national percentile and stanine scores in reading and math for the pretest (Winter 1977/8 middle-first year) and post test (Spring 1978/9 Second year) ED and NED groups, grades 1-2, and 2-3. Also in Table I, a mean increase score between the pre and post test scores is presented for both groups in national percentile, stanine, and scale score.

To measure the statistical significance of the differences in Reading and Math pre and post test scores reported in Table I, an analysis of variance using mean increase scale scores was computed for the groups. The results of this analysis are reported in Tables II and III.

## V. RESULTS

Due to the exploratory descriptive nature of this study the following discussion refers only to the children in the Phillips Extended Day Program and non-Extended Day children at Phillips. Further application of the results to other populations is not possible.

TABLE I

DESCRIPTIVE DATA

MEAN AND MEAN INCREASE SCORES
MATH AND READING

| | | 77/8 - 1st Grade | | 78/9 - 2nd Grade | | Mean Increase - Comparison 1977/8 - 1978/9 | | |
|---|---|---|---|---|---|---|---|---|
| Subject | Group | X Nat'l %ile | X Stanine | X Nat'l %ile | X Stanine | X Nat'l %ile | X Stanine | X Scale Score |
| READING | Total | 47.2 | 4.8 | 60.0 | 5.6 | 12.8 | .8 | 60.69 |
| | ED | 55.0 | 5.4 | 78.3 | 7.1 | 23.3 | 1.7 | 76.7 |
| | NonED | 38.8 | 4.2 | 54.9 | 4.8 | 16.1 | .6 | 47.4 |
| MATH | Total | 61.0 | 5.7 | 73.0 | 6.5 | 12.0 | .8 | 56.4 |
| | ED | 62.0 | 5.9 | 74.0 | 6.7 | 12.0 | .8 | 58.5 |
| | NonED | 59.5 | 5.5 | 66.8 | 6.1 | 7.3 | .6 | 50.7 |

| | | 77/8 - 2nd Grade | | 78/9 - 3rd Grade | | Mean Increase - Comparison 1977/8 - 1978/9 | | |
|---|---|---|---|---|---|---|---|---|
| Subject | Group | X Nat'l %ile | X Stanine | X Nat'l %ile | X Stanine | X Nat'l %ile | X Stanine | X Scale Score |
| READING | Total | 47.5 | 4.8 | 56.4 | 5.2 | 8.9 | .4 | 24.4 |
| | ED | 52.4 | 5.3 | 64.6 | 5.7 | 12.2 | .4 | 27.1 |
| | NonED | 33.0 | 3.9 | 41.7 | 4.5 | 8.7 | .6 | 17.8 |
| MATH | Total | 47.1 | 4.7 | 67.6 | 6.3 | 20.5 | 1.6 | 30.54 |
| | ED | 66.0 | 4.6 | 72.4 | 7.1 | 6.4 | 1.4 | 31.8 |
| | NonED | 33.1 | 4.1 | 58.0 | 5.6 | 24.9 | 1.5 | 18.0 |

ED - Extended Day Group
NonED - Non-Extended Day Group

Descriptive Data

Reading - Pre and Post Test Mean and Mean Increase Scores

Group 1 - First to Second Grade - ED group mean scores on pre and post tests and mean increase between pre and post test were higher than the NED group in all categories, i.e., national percentile, stanine, and scale score. Also, in these same categories, ED group mean scores were above the total group mean and mean increase scores.

In contrast, NED group scores were below the total group mean in all categories. In an examination of the ED and NED pre and post means and mean increase scores, an increase in the spread between group means is evident both within and across years.

The 1977/8 pre test ED mean national percentile score was 16.2 %ile points higher (55.0) than the NED group (38.8). In the 1978/9 post test, the difference between ED mean national %ile (78.3) increased to 23.4%ile points. The ED mean increase between pre and post test for national percentile was 23.3%ile in comparison to a mean increase of 16.1%ile points for the NED group.

The mean increase between pre and post for the ED group in stanine score was 1.7 in comparison to the .6 NED mean increase. The 1.2 mean stanine difference between ED (5.4) and NED (4.2) on the pretest increased slightly to a 1.6 mean stanine difference between ED and NED on the post test (1.7, ED; .6, NED).

Group 2 - Second to Third Grade

ED mean scores in all categories (scale score, national percentile, and stanine) were higher than NED mean scores on both pre and post test. Also, ED mean scores were higher than total group mean scores in all categories.

NED mean scores were lower than both ED mean scores and total group mean scores in all categories.

In only one instance (mean increase, stanine) did the NED group have a higher mean increase (.6) than the ED group (.4).

The difference of 19.4%ile points in the pretest group mean scores (ED - 52.4, NED - 33.0) increased to a 22.9%ile difference between ED (64.6) and NED (41.7) on the post test.

The pretest 1.4 mean stanine difference between ED (5.3) and NED (3.9) decreased slightly to a 1.2 mean stanine difference on the post test (ED - 5.7; NED - 4.5).

Math - Pre and Post Test Mean and Mean Increase Scores

Group 1 - First to Second Grade - For the ED group both mean and mean increase math scores were higher than the NED group and total group mean in all categories.

A widening between group mean scores is seen in the categories of national percentile and stanine.

In the pre test, the ED group mean national percentile (62.0) was 2.5%ile points (59.5) higher than the NED group mean. This difference in group mean increases to a 7.2%ile difference in the post test (ED - 74.0; NED - 66.8). In the category of stanine, the .4 difference between groups (ED - 5.9; NED - 5.5) increased to a .6 difference in the post test (ED - 6.7; NED - 6.1).

Mean increase between pre and post tests in these same categories was higher for the ED group. In national percentile, the ED group had a mean increase of 12.0%ile points in contrast to the NED mean increase of 7.3%ile points. The ED mean increase in stanine was .8 while NED mean stanine increase was .6.

Group 2 - Second to Third Grade

Pre and post test mean scores in national percentile and stanine were higher for the ED group. However, the difference between group means lessened

from pre to post test.

The pretest 32.9%ile difference between ED (66.0) and NED (33.1) decreased to a 14.4%ile difference (ED - 72.4; NED - 58.0) in the post test. However, in the category of stanine, the ED group difference was maintained between pre and post test.

The .5 difference between group mean stanine pre test scores (ED - 4.6; NED - 4.1) increased to 1.5 in the post test (ED - 7.1; NED - 5.6).

Pre and post mean increase scores point up a 24.9 mean national percentile increase for NED in comparison to a 6.4%ile increase for ED. The mean stanine increase is less dramatic between groups; a 1.5 mean stanine increase for the NED group, in comparison to a 1.4 mean stanine increase for the ED group.

Analysis of Variance

As the above descriptive data seemed to indicate a difference between groups in reading and math scores, further analysis of these findings was warranted. The purpose of further statistical analysis was two-fold:

1. To determine if there was any statistically significant difference between ED and NED groups in reading and math in order to reject the following null hypotheses: There is no difference between ED and NED groups in reading as measured on pre and post state test results for Groups 1 and 2.

   There is no difference between ED and NED groups in math as measured on pre and post state test results for Groups 1 and 2.

2. To determine if the difference found in mean scores was statistically significant. If not, any differences could only be attributed to sampling errors.

Analysis of variance was employed to ascertain whether the sample means differ from one another (among-group variance) to a greater extent than the scores differ from their own sample means (within group variance). Because of their more exact numerical nature, pre and post test mean increase scale scores were used in the analysis of variance.

Reading - Group 1 - First to Second Grade

Table II contains the data on the analysis of variance for Group 1 in Reading. The difference between ED and NED mean increase scale scores in reading was significant at the .05 level. The F ratio (5.70) comparing between group sum of squares at one degree of freedom to within group sum of squares at 23 degrees of freedom was greater than the critical value of 4.28.

The null hypothesis may be rejected. Thus, it may be said that there was a statistically significant difference between ED and NED pre and post test mean increase scale scores in reading for Group 1.

Reading - Group 2 - Second to Third Grade

Table II contains the data on the analysis of variance for Group 2 in reading. The difference between ED and NED mean increase scale scores in reading was not statistically significant. The F ratio (1.97) comparing between group sum of squares at 1 degree of freedom to within group sum of squares at 21 degrees of freedom was less than the critical value of 4.30.

Therefore, it is not possible to reject the null hypothesis. There is no statistically significant difference between ED and NED pre and post tests in reading for Group 2.

Math - Group 1 - First to Second Grade

Table III presents the data on the analysis of variance for Group 1 in math. A statistically significant difference at the .01 level was found

TABLE II

ANALYSIS OF VARIANCE
FIRST TO SECOND GRADE
1977/8 - 1978/9
READING
MEAN INCREASE SCALE SCORES - PRE-POST

| Group | Within Group Sum of Squares | df | Est. Variance | Between Group Sum of Squares | df | Est. Variance | F Ratio | Critical Value (.05 level) |
|---|---|---|---|---|---|---|---|---|
| ED | 14,150.70 | 23 | 969.59 | 3,588.48 | 1 | 5,531.30 | 5.70 | 4.28 |
| Non ED | 8,149.87 | | | 1,942.82 | | | | |
| TOTAL | 22,300.57 | | | 5,531.30 | | | | |

| Mean Increase Scale Scores | N |
|---|---|
| ED 76.70 | ED - 14 |
| Non ED 47.40 | Non ED - 11 |
| TOTAL 60.69 | |

ANALYSIS OF VARIANCE -
SECOND TO THIRD GRADE
1977/8 - 1978/9
READING
MEAN INCREASE SCALE SCORES - PRE-POST

| Group | Within Group Sum of Squares | df | Est. Variance | Between Group Sum of Squares | df | Est. Variance | F Ratio | Critical Value (.05 level) |
|---|---|---|---|---|---|---|---|---|
| ED | 5,121.83 | 21 | 340.16 | 44.55 | 1 | 672.50 | 1.97 | 4.30 |
| Non ED | 2,021.64 | | | 627.95 | | | | |
| TOTAL | 7,143.47 | | | 672.50 | | | | |

| Mean Increase Scale Scores | N |
|---|---|
| ED 27.10 | ED - 16 |
| Non ED 17.80 | Non ED - 7 |
| TOTAL 24.43 | |

between ED and NED pre and post mean increase scale scores. The F ratio of 5.10 was above the critical value of 4.54. Therefore, the null hypothesis may be rejected. Therefore, there was a statistically significant difference between ED and NED pre and post test mean increase scale scores in math for Group 1.

Math -
Group 2- Second to Third Grade

Table III contains the data on the analysis of variance for Group 2 in math. Analysis of variance between ED and NED mean increase scale scores produced an F ratio of 10.93. This F ratio was above the critical value of 7.94 at the .01 level of significance.

Thus, the null hypothesis may be rejected at the .01 level. There was a statistically significant difference between ED and NED pre and post test mean increase scale scores in math for Group 2.

To summarize, through analysis of variance a statistically significant difference was found between ED and NED groups in the following:

(1) Reading - Group 1 - First to Second Grade

(2) Math - Group 1 - First to Second Grade

(3) Math - Group 2 - Second to Third Grade

Based on the above the null hypotheses were rejected and/or adjusted as follows:

. Accepted/Adjusted Hypothesis - There is no difference between ED and NED Groups in reading as measured on pre and post state results for Group 2.

. Adjusted/Rejected Hypothesis - (.05 level) There is no difference between ED and NED groups in reading as measured on pre and post state test results for Group 1.

. Rejected Hypothesis - (.01 level) There is no difference between ED and NED groups in math as measured on pre and post state test results for Groups 1 and 2.

TABLE III

ANALYSIS OF VARIANCE
FIRST GRADE TO SECOND
1977/78 - 1978/9
MATH
MEAN INCREASE SCALE SCORES - PRE-POST

| Group | Within Group Sum of Squares | df | Est. Variance | Between Group Sum of Squares | df | Est. Variance | F Ratio | Critical Value (.05 level) |
|---|---|---|---|---|---|---|---|---|
| ED | 1,211.60 | 15 | 130.91 | 441.00 | 1 | 668.43 | 5.10 | 4.54 |
| Non ED | 752.05 | | | 227.43 | | | | |
| TOTAL | 1,963.65 | | | 668.43 | | | | |

| Mean Increase Scale Scores | | N | |
|---|---|---|---|
| ED | 58.5 | ED | 10 |
| Non ED | 50.7 | Non ED | 7 |
| TOTAL | 56.4 | | |

ANALYSIS OF VARIANCE
SECOND TO THIRD GRADE
1977/8 - 1978/9
MATH
MEAN INCREASE SCALE SCORES - PRE-POST

| Group | Within Group Sum of Squares | df | Est. Variance | Between Group Sum of Squares | df | Est. Variance | F Ratio | Critical Value (.01 level) |
|---|---|---|---|---|---|---|---|---|
| ED | 473.34 | 22 | 117.34 | 25.40 | 1 | 1,283.41 | 10.93 | 7.94 |
| Non ED | 2,108.06 | | | 1,258.01 | | | | |
| TOTAL | 2,581.40 | | | 1,283.41 | | | | |

| Mean Increase Scale Scores | | N | |
|---|---|---|---|
| ED | 31.8 | ED | 16 |
| Non ED | 18.0 | Non | 8 |
| TOTAL | 30.54 | | |

## VI. SUMMARY AND CONCLUSIONS

### Summary

The Phillips Extended Day Program was designed to expand and enrich the regular elementary curriculum in the before and after school hours. Children were enrolled by parent application on a voluntary basis. There was no difference between ED and NED children in socioeconomic, racial, or ethnic group.

State test results were available for ED and NED children from the first two years of the program (1977/8 to 1978/9). Comparison of test scores was made for two groups from this two year period:

Group 1 - First to Second Grade

Group 2 - Second to Third Grade

For purposes of statistical analysis, mid-year 1977/8 scores were treated as the pre test measure and the 1978/9 year end scores as post test. Initial analysis of the comparison between pre and post national percentile and stanine mean and mean increase scores for ED and NED groups indicated a difference in group means which generally increased from pre to post test.

After this initial analysis, the difference between groups was analyzed further for its statistical significance. Analysis of variance was used to determine the statistical significance of the differences in ED and NED pre and post reading and math mean increase scale scores.

Statistically significant differences were found between ED and NED math scores for both Groups 1 and 2. No statistically significant difference was found between ED and NED in reading for Group 2. There was a significant difference between ED and NED in Reading for Group 1 only.

### Conclusions

As the above report is an exploratory descriptive study in the genre

of action research, its inherent lack of controls precludes any attempt at forming definitive conclusions. Only a few straightforward conclusions may be drawn.

In the small sample studied there was a difference in math test results between ED and NED children, through grades 1, 2, and 3. There was a difference in reading test results between ED and NED for one group (Group 1). There was no difference in reading test results between ED and NED for the other group (Group 2).

Due to the absence of controls, it cannot be conclusively stated that it was the Extended Day Program per se, which totally accounted for these differences. Many variables must be controlled before the extended day program's true educational effect may be measured.

However, it may be said that some one variable or a combination of variables in the extended day environment made a positive contribution toward the childrens' academic growth.

This fact may be surprising to many who believe a lengthened school day has negative effects on children.

The extended day program goal to enrich and expand the academic curriculum for children appears to have been successful. That is, if degree of enrichment and expansion may be measured by state test results in reading and math. More precisely, by external signs (test scores) ED children had achieved more curriculum objectives. Hence, their exposure to curriculum concepts may have been more enriched due to their longer and more varied exposure to them per day. (For further discussion of the enrichment activities, see Section VII. Educational Implications of the Extended Day Program).

In this regard, it is interesting to note that both Groupland Group 2 in ED had significantly different (higher) scores in math than non ED children over the two program years. One of the most popular stations in the

Phillips Extended Day Program is the Math/Science Room. The annual parent evaluation has confirmed this both program years.[2] Math concepts are taught in an activity-based curriculum in this room. It is interesting to speculate on the possible correlation between the hands-on experimental approach to math in the Extended Day Program and the significantly higher ED group mean increase scores in math. (See Section VII, "Educational Implications of Program for a more indepth description of the math/science curriculum.)

Although there remain many variables yet to control and measure, this action research on Phillips Extended Day Program is a crucial beginning. Public school involvement in day care has been, since its inception, virtually unmeasured. With the growing need for this type of public school child care must come a dedication to providing the best possible learning environment in the before and after school hours.

Extended Day learning environments must be consistently evaluated for effectiveness as any other educational innovation. Without careful evaluation, their effectiveness can only be speculative.

Despite the fact that this action research is exploratory and based on a small sample, it represents one of the first attempts to measure the academic effectiveness of an extended day program. Hopefully, ensuing research on Phillips will more closely approach pure research.

## EDUCATIONAL IMPLICATIONS OF PROGRAM

Based on the preceding data, there are some statistical grounds on which to base the premise that Phillips Extended Day Program did make a difference in children's academic growth. Although it cannot be precisely stated how this specific contribution was made, the extended day learning environment in which the reported growth occurred can be described.

The basic framework underlying the extended day curriculum was based on the learning theories of Bloom and Piaget. In essence, the program components were designed to meet the three levels of learning in Bloom's taxonomy: cognitive, affective, and psychomotor.[3] Individual stations/centers were designated for each level. The P.E. Station for psychomotor, art center/drama for affective, and the math/science and library/learning centers for the cognitive domain.

Teachers certified to teach in these areas were hired for the program. In addition, in each of these areas, attention was given to planned inclusion of the other two domains in all unit planning and activities.

This attention to learning domains was evidenced in the Phillips Extended Day Program from the onset. For example, in P.E., children not only played by the rules of soccer, but researched the history of the game in the learning center, wrote and illustrated stories (in the Art Center) of the sport and its heroes. Thus, the psychomotor domain (playing the sport) was enhanced by cognitive and affective activities.

Piaget's theory provided the rationale for the activity-based curriculum. The Piagetian concepts of assimilation and accommodation point up the need to provide a learning environment rich in the opportunities for both physical

and intellectual concept manipulation.[4] Theoretically, each child is able to build upon previous mental concepts in order to grasp new concepts, given time, activities, and materials appropriate to his level of development.

In the Extended Day Program at Phillips, this developmental concept was integrated into the curriculum in the overall laboratory/experimental approach to learning. In each center, learning activities were planned to provide relaxed, hands-on activities based on the academic curriculum.

For example, in the Math/Science Center, metric measurement was taught through cooking activities. Metric and non-metric fractions were learned in the process of measuring ingredients for a recipe, cooked in the room's tiny kitchen area, and later enjoyed by all the "cooks."

Learning to conserve (in a Piagetian sense) was accomplished in the Math/Science Center in a "mini-lab" which was a table filled with "science stuff" (as described by the children). Test tubes and beakers of various sizes, sometimes filled with water, sometimes with sand, provided children an opportunity to experiment with quantity.

Without the more stringent "regular" classroom constraints, the ED children had the opportunity of trying, possibly failing, and eventually (at an individual pace) successfully grasping a concept. In all the ED centers children were encouraged to experiment and try out new ideas in a specially designed environment.

The environment of the Phillips Extended Day was designed to provide a non-threatening learning environment for K-5th grade children's exploration of new ideas. If, for instance, in the Math/Science Center, the child's attempt at electrical circuit construction was not initially successful, the regular classroom time limit on a science lesson did not curtail further attempts. And the smaller teacher-child ratio naturally allowed more "turns" than in a regular classroom. This lessening of time constraints had as its

the encouragement of further experimentation. The existence of the option of further experimentation became enrichment for those who grasped the concept, and remediation for those still in the process.

Although the math/science room was the topic of the above stated program example, the same open-ended approach to encourage physical (and hence mental) exploration of curricular concepts was present in the other core areas of the Phillips Extended Day Program. (Art, P.E., Learning Center/Library, and Music).

The presence of a multitude of hands-on centers, mini centers, private corners, and alternate activity centers in each of these core area rooms gave evidence of the program's dedication to a learning environment rich in possibilities for exploration.

As the extended day teams are multi-aged grouped (K-1, 2-3, 4-5) all the activity centers include materials appropriate for the developmental level of these groups. Further, in these activities, curriculum concepts are expanded both vertically (in difficulty) and horizontally (for enrichment) for the multi-aged groups. For example, in the art center the ED teams designed several choices for the new school emblem and motto. All teams voted on the winner. Subsequently, each child had the opportunity to silk-screen the design onto a t-shirt, or any article/material of his/her choice.

Interestingly enough, the winning motto/emblem coincided with the unit on energy being covered in the math/science room. In this way, the sun became the symbol of Phillips Magnet with the motto, "Phillips Shines." This occurred in the same time period in which the ED children were constructing a model solar energy plant after visiting an experimental solar energy plant at a nearby university.

In summary, while the effect of individual factors making up this

environment need to be more systematically studied in future research, children in the Phillips Extended Day Program will continue to have the opportunity of learning in a stimulating yet non-threatening environment.

FOOTNOTES

1. A more complete program description including design, staffing, scheduling, and evaluation is contained in the following articles: Mary E. Mayesky, "Extended Day Program in a Public Elementary School," Children Today, May-June, 1979, pp. 6-9. DHEW Publication No. (OHDS) 79-30014.

   Mary E. Mayesky, "Successful Attempt at Voluntary Desegregation: The Phillips Magnet," Phi Delta Kappan, Sept., 1979.

2. Reports of the Parent Evaluation are contained in the above two articles.

3. Benjamin S. Bloom (ed.), Taxonomy of Educational Objectives, Handbook I: Cognitive Domain, New York: David McKay Co., Inc., 1956.

4. Jean Piaget, The Origins of Intelligence in Children. New York: International Universities Press, 1952 (norton Library Editions, 1963).

APPENDIX A

DESCRIPTION OF READING (PRI) AND MATH (DMI) STATE TESTS

Reading Test (PRI)

The North Carolina Reading and Math tests were developed for use nationwide. First and second graders took two tests: The Prescriptive Reading Inventory (PRI) and the Diagnostic Mathematics Inventory (DMI). Both tests are cirterion-referenced tests designed to determine whether or not each student has mastered each objective in a set of educational objectives. The items in the PRI and DMI are directly associated with those objectives.

The objectives measured by the PRI were selected to provide a continuous broad domain of objectives, with specific reading behaviors listed under each for grades one and two. They are written at a level of specificity that describes the reading behavior expected to result from normal educational growth and instruction.

Math Test - DMI

The objectives measured by the Diagnostic Mathematics Inventory (DMI) are organized so that objectives dealing with counting, and matching precede those relating to addition and subtraction of whole numbers. Measurement, sequence, and missing addends precede geometry and numeration systems. On the second grade tests, regrouping categories are introduced for addition and subtraction, and multiplication is added. Also, measurement is expanded, and preoperational concepts in fractions are initiated.

Third grade students took the norm-referenced California Achievement Test (CAT). This test allows comparison of students with a national norm group.

The major content areas included in the CAT are reading, spelling, language and mathetmatics. Items under each area were written to measure

mastery of selected educational objectives, For the CAT, an objective is represented by cluster of several test items. A table of conversion scores has been developed to compare DMI and PRI scores with the CAT.